1 Preliminary BioSig user manual: Studies

1.1 Introduction

BioSig has the following features:

1. Laboratory Information Management (LIM), which is labeled as *Resources in the interface*
2. *Experimental design and annotation that is tightly coupled with the LIM*
3. *Experimental design plate layout and minimal set of reagents plates*
4. *Protocol specification*
5. *Automated upload/download of images for a specific experiment*
6. *Visualization of images and computed representation following detailed image analysis*

1.2 Study

In Biosig, “Study” is the most important concept. One study contains one or more “Experiments.”

The user defines his experiments with other information stored in the system such as celllines, compounds, and antibodies. The system can generate the plate layout map automatically, which be used by a research assistant to plot the physical plate. The data store in the system can also be used to drive a robot to plot the plate automatically.

To access the Study page, select “Studies” from the menu bar. Users will see the Study List page, as show in Figure 1. From there, the user will be able to start different tasks.

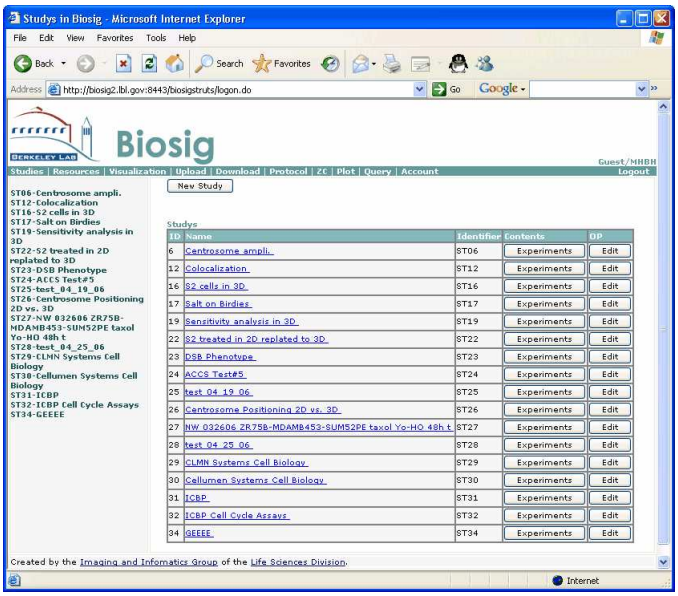

Figure 1: Study List page

1.3 Make a new study

The user goes to the “New Study” page by clicking the ”New Study” button. As shown in Figure 2, a study has the following fields:

- Name. The name of the study. Name must be unique across the whole system.
- Description. The description of the study.
- Notes. The notes for the study.
- Global Shared. If this option is not checked, the study and all the experiments in the study will not be visible to people outside the Lab. On the other hand, if this option is selected, the study will be visible to people outside the Lab. But the experiments in the study may or may not be visible, depending on the shared property of each experiment. Shared studies are not editable to people outside.

  To save the new study, click the “Save” button.

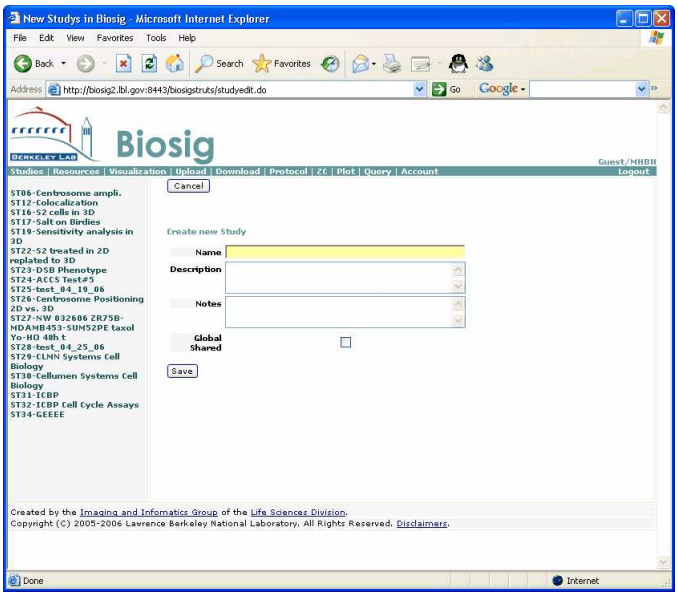

Figure 2: New study page

1.4 Edit a study

Clicking the “Edit” button from Study List or Study View page will take the user to the Study Edit page. It is very similar to the “New Study” page as shown in Figure 2. The user can make changes to the study in this page.

1.5 Make a new experiment

In the “Study View” page, if the user clicks the “New Experiment” button, it will go to the “New Experiment” page as shown in Figure 3. An experiment has the following fields:

- Name. The name of the experiment. Name must be unique across the whole system.
- Description. The description of the experiment.
- Notes. The notes for the experiment.
- Type. The type of the experiment. It is one of the following selections: “Imaging”, “Gene Expression”, “Protein Array” or “Gene Expression and Protein Array.”
- Protocol. The protocol of the experiment.
- LSID. User can define an LSID for this experiment.
- Design Category. The category of this experiment. Different Design Categories have different selections for ”Design Type”.
- Design Type. The design type of the experiment.
- Global Shared. It this option is not checked, the experiment is not visible to people outside the Lab. If this option is checked, the experiment is visible to people outside only if the study is also shared. Shared experiments are not editable to people outside.
- Copy Experimental Factor. User can copy experimental factors from another experiment to avoid inputting them again.

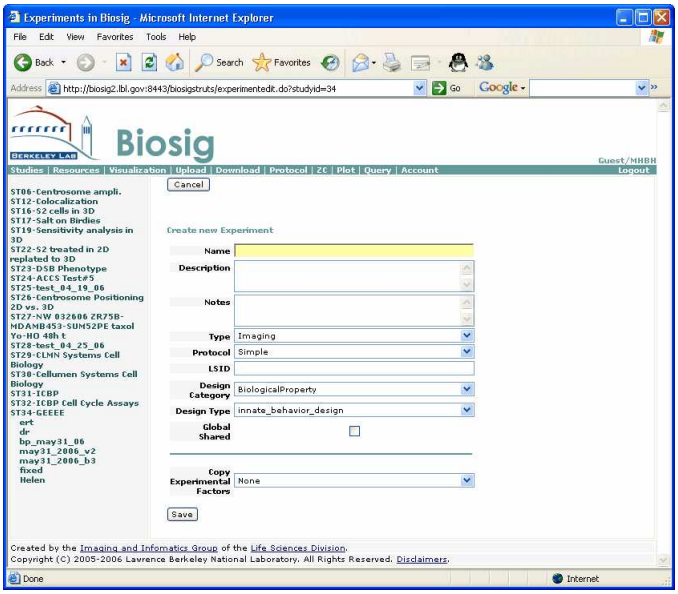

Figure 3: New experiment page

1.6 Update an experiment

Clicking the ”Edit” button from the ”Experiment List” or ”Experiment View” page will take the user to the ”Experiment Edit” page. It is very similar to the ”New Experiment” page as shown in Figure 3. The user can make changes to the experiment in this page.

1.7 Experiment design

The most important work for an experiment is to design its experimental factors, which will be used to generate the plate layout. Clicking the ”Experiment Design” button from the ”Experiment View” page will take the user to the ”Experiment Design” page, as shown in Figure 4. The first step is to select factor types. For Bio Source, there are currently Cell line and Tissue. For Transfection Treatment, we have ”DNA”, ”Virus”, and ”RNAi”. The user can also select Compound Treatment, Radiation Treatment, and Harvest Time for the experiment.

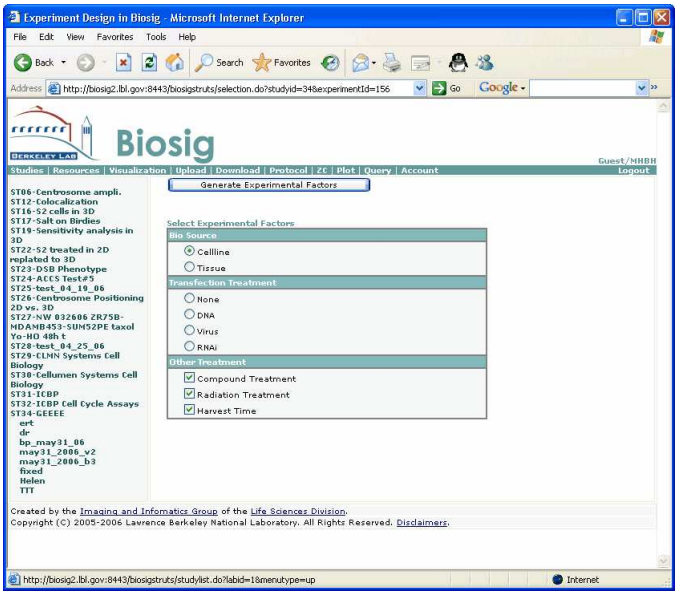

Figure 4: Select experimental factor type

After the experimental factor type is selected, click the ”Generate Experimental Factors” button. It will go to the ”Experimental Factor Design” page, as shown in Figure 5.

To add a new cell line, the user needs to select the following fields:

- Name. The name of the cell line.
- Passage Number. The Passage number of the cell line.
- Type. 2D or 3D cell line.
- Conc Value. The concentration of the cell line.
- Conc Unit. The concentration unit.
- Co Cultured. The cell line is co-cultured or not.
- Comments. Any comments.

Click ”Add” to add the experiment factor or click ”Delete” to delete a pre-added cell line. See Figure 6.

To add a new compound, the user needs to select the following fields:

- Name. The name of the compound.

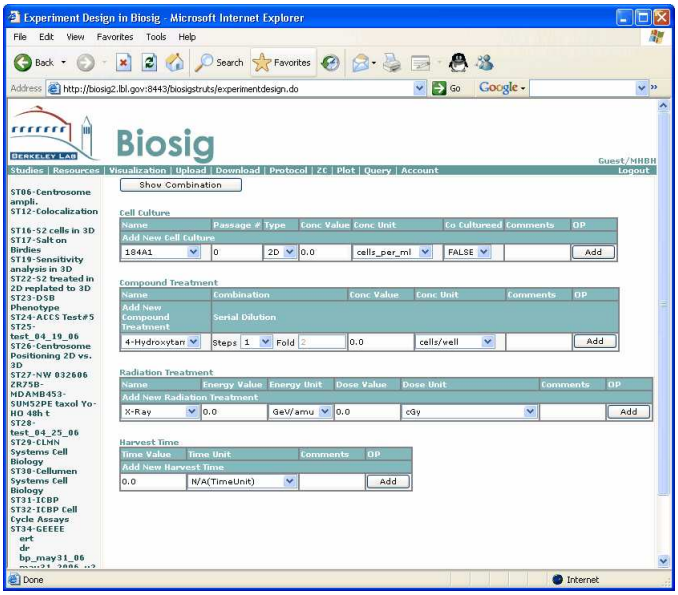

Figure 5: Experimental Factor Design page

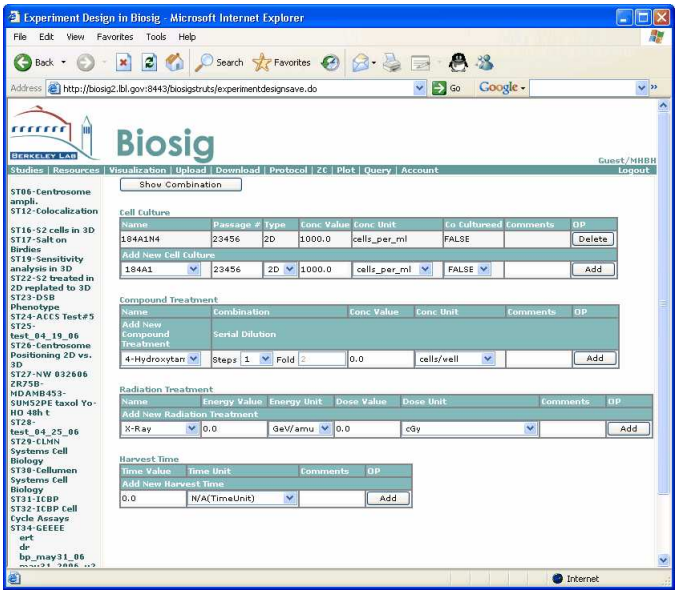

Figure 6: Experiment design

- Serial Dilution. Biosig make it easier for the user to input serial dilution of a compound. The user can select steps and fold for serial dilution and the system will add appropriate experimental factors automatically. See Figure 8 and 9. If it is not a serial dilution, select 1 as the step.
- Conc Value or Init High Conc. The concentration of the Compound. If it is a serial dilution, this is the highest concentration. Each sequential concentration will be divided by the ”fold” value.
- Conc Unit. The concentration unit.
- Comments. Any comments.

Click ”Add” to add the experiment factor or click ”Delete” to delete a pre-set compound. See Figure 7.

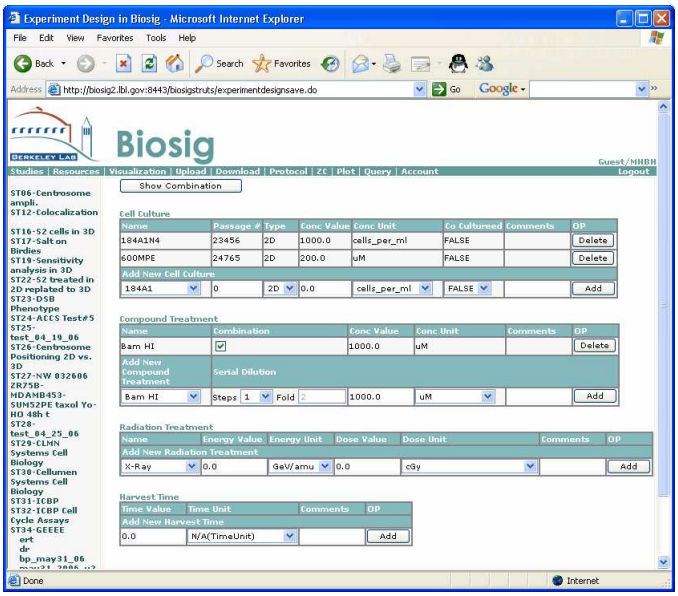

Figure 7: Experiment design

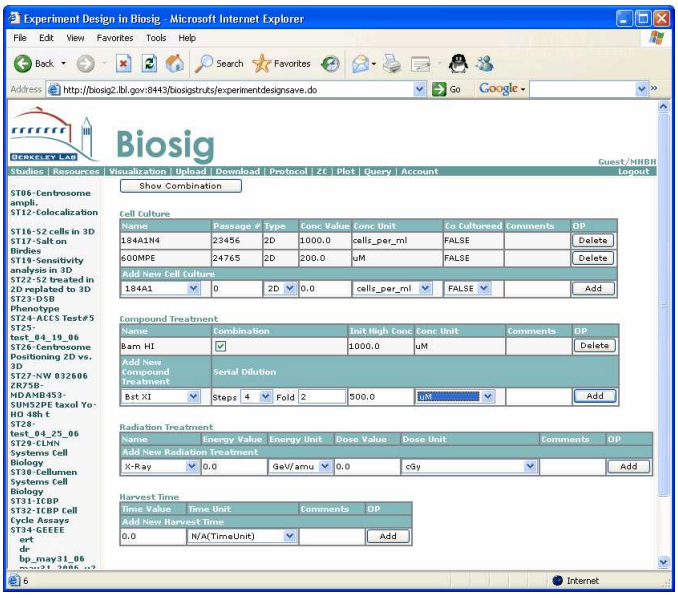

Figure 8: Experiment design

When there is more than one compound experiment factor, the user can do compound combination or permutation by selecting the appropriate method and number. To limit the number of compound experiment factors participating in the combination or permutation, the user can make selections in the ”Combination” column.

To add a new Radiation Treatment, the user needs to select the following fields:

- Name. The name of the radiation.

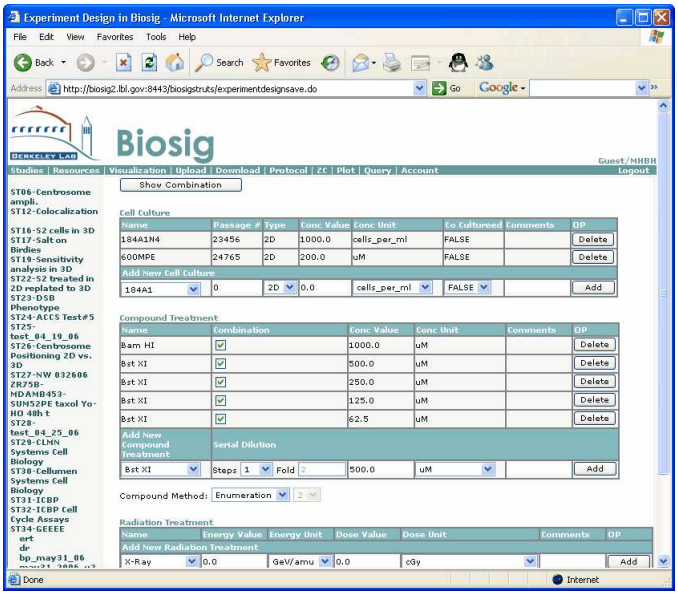

Figure 9: Experiment design

- Energy Value. The energy value of the radiation.
- Energy Unit. The energy unit of the radiation.
- Dose Value. The dose value of the radiation.
- Dose Unit. The dose unit of the radiation.
- Comments. Any comments.

Click ”Add” to add the experiment factor or click ”Delete” to delete a pre-set radiation.
To add a new Harvest Time, the user needs to select the following fields:

- Time value. The name of the harvest.
- Time unit. The unit of the harvest time.
- Comments. Any comments.

Click ”Add” to add the experiment factor or click ”Delete” to delete a pre-set harvest time.
A completed experiment design is shown in Figure 10

After all experimental factors have been input into the system, the user clicks the ”Show Combination” button to go to the ”Combination Page”, as shown in Figure 11. The combination is a joint production of different experimental factors. For compound, there may also be combination or permutationi, if the user selected them in the previous page. The user can select the desired experimental factor combinations in this page. Unselected combinations will not be used in the following pages.

After the selection is made, the user clicks the ”Update” button to go to the ”Imaging Staining” page, as shown in Figure 12. Imaging Staining is define in groups. The user can make a new group by clicking the ”New Group” button, as shown in Figure 13. The user then selects a staining item and adds it to this group by clicking the ”Add” button. The user can delete a pre-selected item by clicking the ”Delete” button. See Figure 14. To add another group, click the ”New Group” button and repeat the process again. See Figure 15.

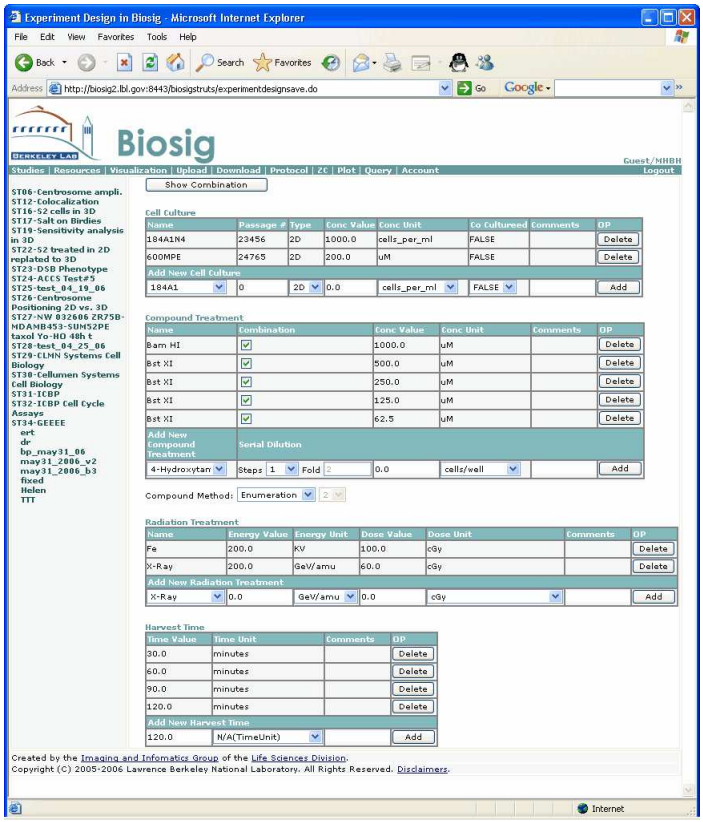

Figure 10: Experiment design

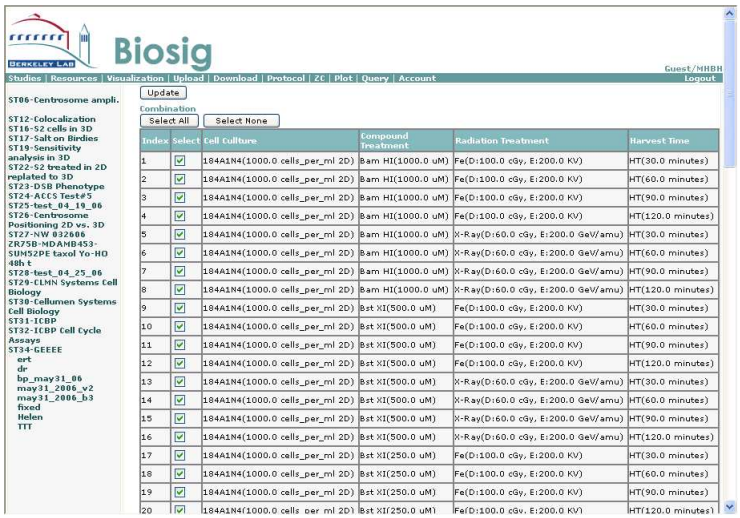

Figure 11: Combination

After everything is completed on the Imaging Staining page, the user is taken to the BioAssay page by clicking the ”BioAssay” button. In this page, the system produces a further joint of experimental factors and imaging staining, as shown in Figure 16. The user selects the combinations to put into the plates.

The ”Update” button will then take the user to the ”Plate Design” page, as shown in Figure 17. Plate design has the following fields:

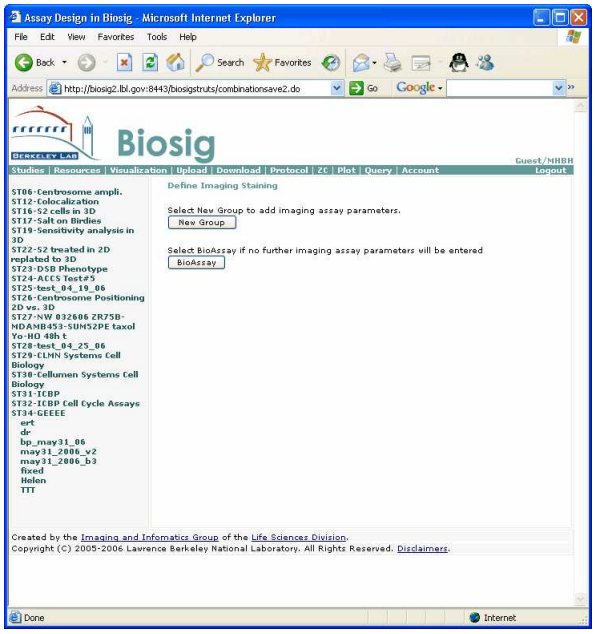

Figure 12: Imaging Staining page

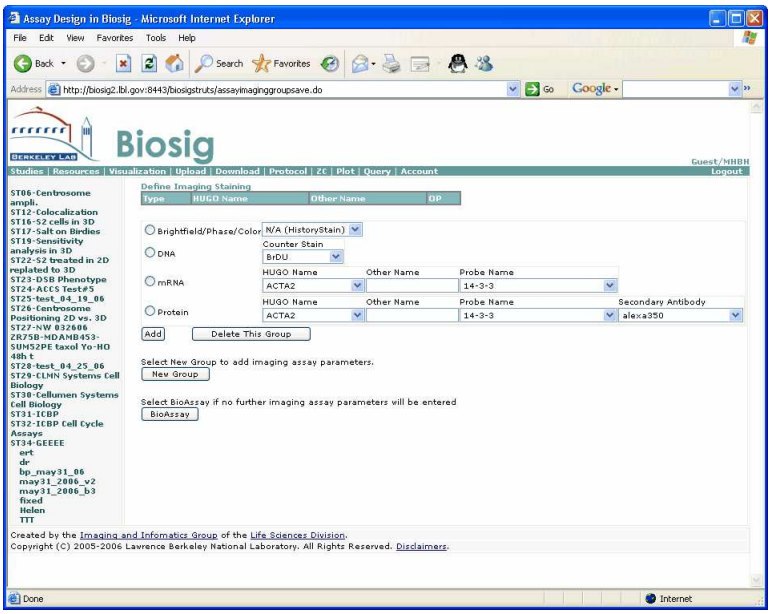

Figure 13: Imaging Staining page

- Plate Type. Select the appropriate size of the plate.
- Number of Duplicate Experiments. This is the number of repeats of one bioassay combination in one plate.
- Number of Replicate Plates. This is the number of repeats of plates. The user can make copies of the same plates.
- Layout Policy. This is the order in which bioassay will be plotted on the plate. It can be Row,

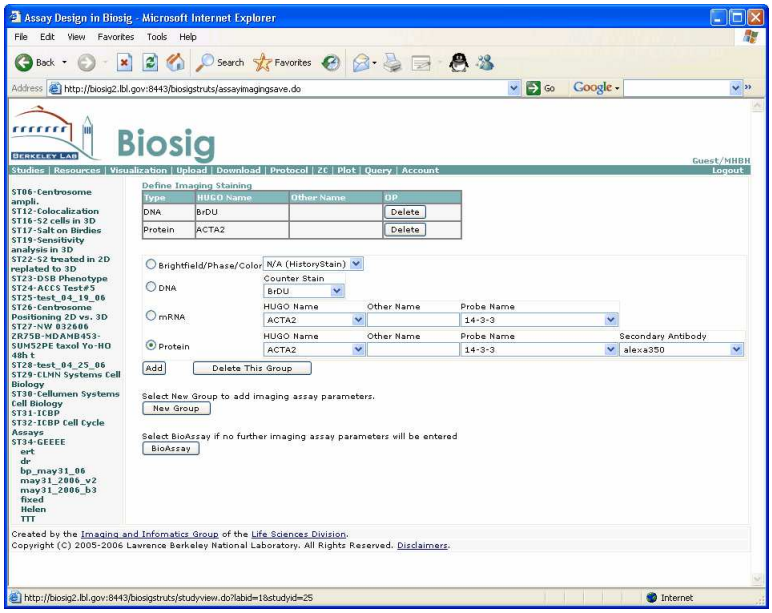

Figure 14: Imaging Staining page

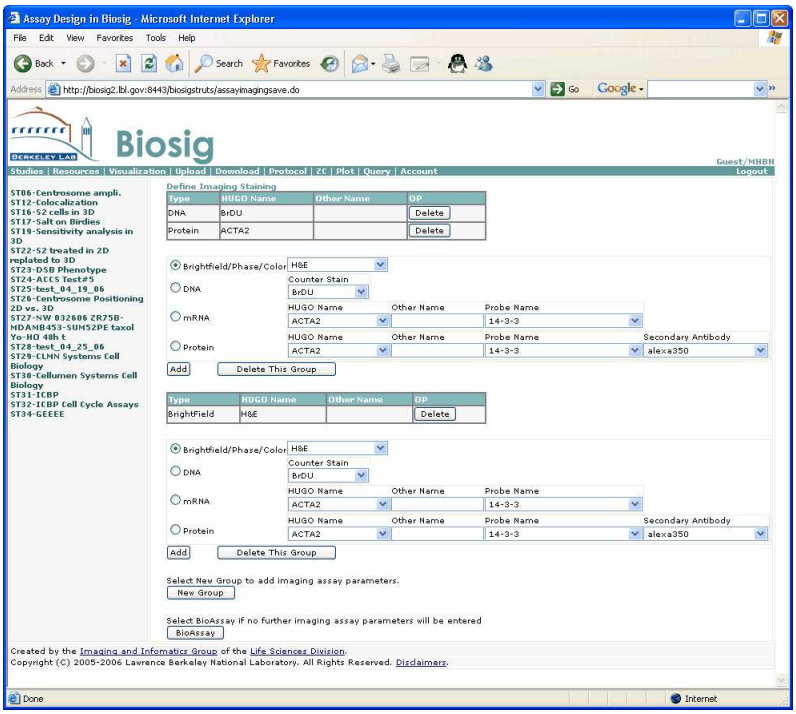

Figure 15: Imaging Staining page

Column, or Block. If Row is selected, the system will try to fully occupy one row first before going to the next one. If Column is selected, the system will try to fully occupy one column before going to the next one.

- Unique Imaging Staining per Plate. If this option is checked, the system will put the bioassay with the same Imaging Staining in one plate.

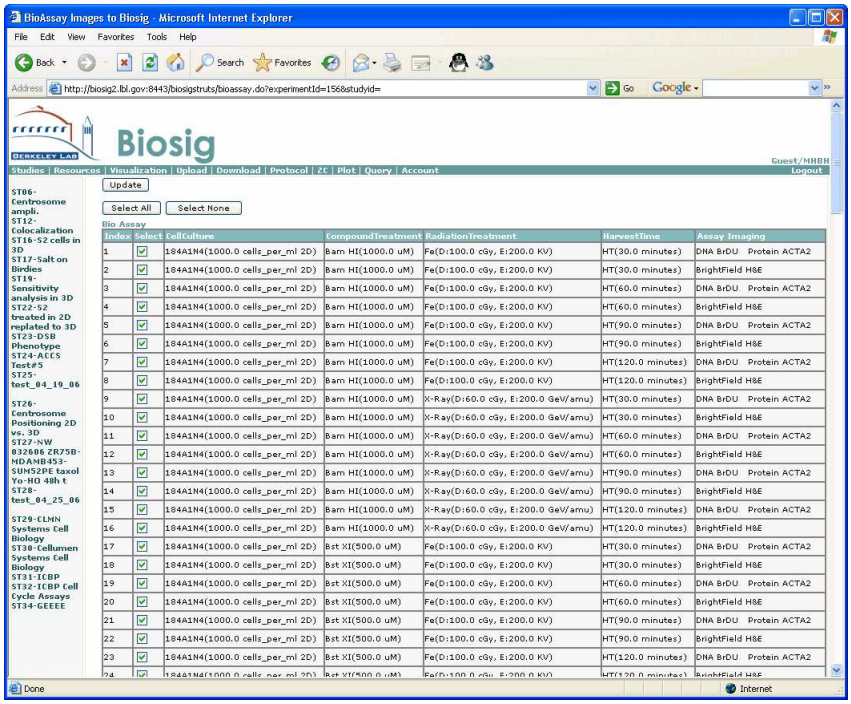

Figure 16: BioAssay page

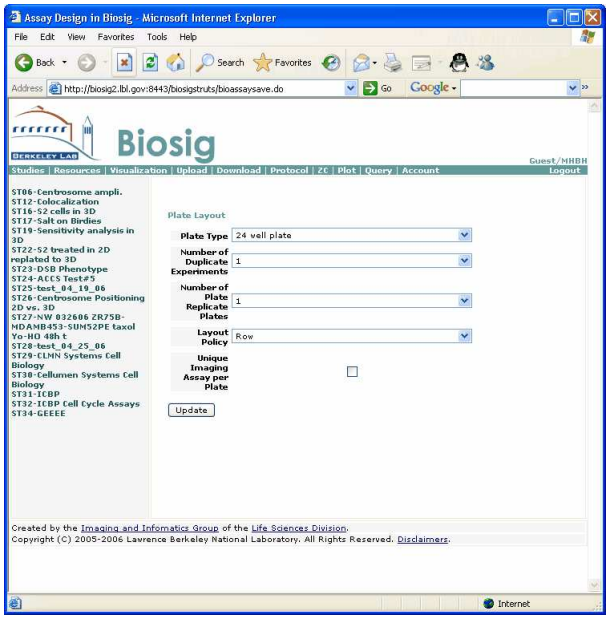

Figure 17: Plate Design

After the plate is designed, click the ”Update” button, it will take the user to the Plate Display page, as shown in Figure 18.

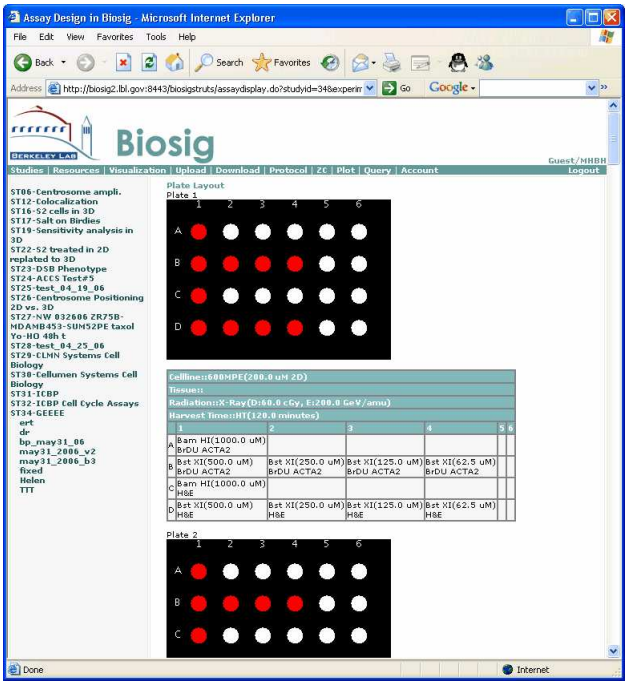

Figure 18: Plate Display

2 Resources

3 Visualization

4 Upload

5 Download

6 Protocol

7 Plot

8 Query

9 Account

10 Others